BULLETIN

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Seed Potato Certification in Pennsylvania

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Plant certified seed—it pays

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Seed Potato Certification in Pennsylvania

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HISTORY OF CERTIFICATION

Seed potato certification work was first started in the United States in 1914. Since that time numerous changes have been brought about in the rules and regulations governing this service. Certification is no longer under trial; this can be seen by the constantly increasing demand for certified seed potatoes. The quality of certified seed is also getting better each year, due principally to the more rigid standards that have been put into force in the various states that are producing certified seed. At the 1924 annual meeting of the Potato Association of America, Dr. H. C. Moore reported a total of over 11,000 comparative tests of certified and non-certified seed conducted in 27 states with an increase of 46.4 bushels to the acre in favor of the certified seed.

This work was first started in Pennsylvania in 1920. The chief purpose of the certification inspection service is to protect the seed buyer and provide a reliable source of seed stock of the highest quality. It is believed that there are opportunities in Pennsylvania for the production of high quality seed potatoes, just as there are opportunities for the production of pure bred livestock. Good seed potatoes are just as important to the potato grower as good breeding stock is to the dairy industry. An industry like the growing and distribution of seed potatoes would soon develop variations in quality and grade of the product unless the industry were standardized. The Bureau of Plant Industry has undertaken to define the limits of both quality and grade through the certification inspection service. Any person who purchases Pennsylvania certified seed potatoes can do so with the feeling that he is getting a product that will give uniform and satisfactory results if given a fair chance because of the high standards which certification represents. The certification service is carried on by the Bureau of Plant Industry under the authority of the State Department of Agriculture.

The states and provinces engaged in certifying seed potatoes with the agencies through which the inspection work is authorized, are given in the following table:

AUTHORITY ADMINISTRATING CERTIFICATION SERVICE

State	Authority
California	State Department of Agriculture, Sacramento
Colorado	Agricultural College, Fort Collins
Idaho	Agricultural College, Boise
Kentucky	Agricultural College, Lexington
Maine	State Department of Agriculture, Augusta
Maryland	Agricultural College and Maryland Seed Certification Board, College Park
Michigan	Agricultural College and Crop Improvement Association, East Lansing
Minnesota	State Department of Agriculture, St. Paul

Montana .....Agricultural College and Potato Improvement Association, Bozeman
Nebraska .....Agricultural College and Seed Growers' Association, Alliance
New Hampshire.Agricultural College, Durham
New Jersey ....State Department of Agriculture and State Potato Association, Trenton
New York .....College of Agriculture and Seed Improvement Association, Ithaca
North Dakota...State Seed Commission, Agricultural College
Ohio .....Seed Growers' Association, Wooster
Oregon .....Agricultural College, Corvallis
Pennsylvania ..Pennsylvania Department of Agriculture, Harrisburg
South Dakota...Agricultural College and Growers' Association, Brookings
Vermont .....State Department of Agriculture, Montpelier
Washington ....State Department of Agriculture, Olympia
Wisconsin .....Agricultural College, Madison
Wyoming .....Agricultural College, Laramie
British Columbia. Department of Agriculture, Victoria
Canada .....Central Experimental Farms, Ottawa

INSPECTION AND CERTIFICATION STANDARDS

The standards adopted for the certification of seed potatoes in Pennsylvania were drawn up in co-operation with the Extension Service of the Pennsylvania State College and the Pennsylvania Potato Growers' Association. Under these standards at least two inspections are made in the field during the growing season, one coming as early in the growing season as it is possible to make accurate

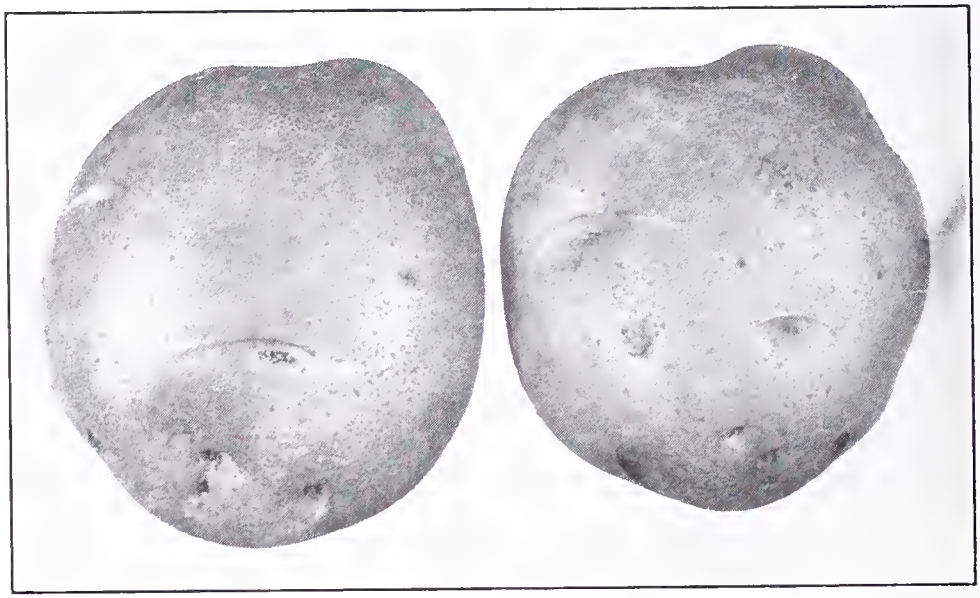

Fig. 1—Typical specimens of (Mason) White Rural Potatoes

disease identifications. Should a grower find it necessary and desirable to rogue a field after the first inspection has been made the work of removing the diseased plants can then start without delay. Diseased plants should be removed as early in the season as possible in order to prevent the spread of the degenerative diseases to adjacent healthy plants. The second or succeeding inspections are made at suitable intervals, depending on conditions.

Basic Requirements

1. Application for the certification service must be made before July 1st on blanks which will be furnished by the local county agent or the Bureau of Plant Industry. These blanks must reach the office of the Bureau of Plant Industry by the above date.

2. Only standard commercial varieties, free from mixture, will be considered for certification.

3. The source of seed used is an important factor and will be so considered in approving fields for certification.

4. Seed potato production will be encouraged only in case of growers who prove themselves capable of producing good seed.

5. Conditions under which seed potatoes will be certified include good culture, which implies crop rotation, control of insects, good tilth and freedom from weeds and disease.

6. All fields entered for certification must be isolated from other potatoes that show more disease than is permitted at the final inspection, by a distance of 150 feet when this space is covered by a short growing grain or hay crop; or 30 feet when this space is covered with a tall growing crop such as corn.

7. Fields entered for certification may be rogued at the discretion of the grower. No rogueing is permitted, however, until after the first inspection.

8. A certificate of certification will be granted to those growers whose fields pass the field inspection requirements.

9. Any seed grower who is found guilty of misusing the certification tag or who willfully makes any misrepresentation concerning his seed stock, or who violates any of the rules and regulations for the certification of seed potatoes will have his certificate of certification revoked.

10. Fields that fail to show the proper amount of thrift and vigor as determined by the inspector shall be refused certification. Any grower who shall neglect the culture of his seed field as indicated by the presence of weeds, etc., will be refused certification.

11. All fields showing a stand of less than 85 per cent will be refused certification.

12. No fields of less than 3 acres will be considered for certification.

Inspection Requirements

In order to qualify potatoes for certification at least two inspections will be made in the field during the growing season. A third inspection will be made of the crop at shipping time. At the option of the inspector additional field or tuber inspection may be made.

First Field Inspection:

Fields will be rejected that contain more than the following percentage of disease, or more than 5 per cent of all these

diseases combined: Leafroll, 4 per cent; Mosaic, 3 per cent; Giant Hill, 3 per cent; Blackleg, 2 per cent; Wilt, 2 per cent.

Final Field Inspection:

Fields will be disqualified which contain more than 2 per cent combined of the following diseases: Leafroll, Mosaic, Giant Hill, Blackleg and Wilt.

Fields showing late blight will be rejected.

STANDARD GRADES FOR SEED POTATOES

The standard grades for seed potatoes in Pennsylvania shall be the following:

Pennsylvania Certified Seed Grade. This grade shall include only potatoes which have passed the field inspection requirements of the Bureau of Plant Industry.

Potatoes showing Black Heart, or excessive sweating, sprouting or shrivelling, indicating improper storage, shall not be allowed in this grade.

This grade shall consist of potatoes of one variety which are well shaped and free from dirt or foreign matter, sunburn, second growth, growth cracks, cuts, bruises, diseases, insect injury or other damage, injury or defect; provided that the total of all potatoes showing such defects shall not exceed 2 per cent by weight; provided further that the following tolerances by weight are not exceeded:

Common scab—3 per cent of moderate infection.
Stem-end discoloration—5 per cent.
Wireworm injury—5 per cent of moderate injury.
Rots and freezing injury—1 per cent.
The total tolerance of all the above defects, excluding stem-end discoloration, shall not exceed 6 per cent by weight.

The potatoes in this grade must comply with one of the following size requirements, providing that the tolerance of 3 per cent, by weight, above or below these size requirements is not exceeded:

"Standard Size"—Minimum diameter 1⅞ inches, maximum weight 12 ounces.

"Small Size"—Minimum diameter 1½ inches, maximum diameter 1⅞ inches.

Pennsylvania Field Certified Seed Grade. This grade shall consist of potatoes which have passed all field inspection requirements of the Bureau of Plant Industry, but which may not have been graded or sized according to the requirements of the "Pennsylvania Certified Seed Grade."

Definition of Terms. "Well shaped" means the normal, typical shape for the variety in the district where grown, and free from pointed, dumbbell shaped, excessively elongated and other ill-formed potatoes.

"Dirt" refers to adherent mud, earth, or caked soil.

"Foreign Matter" refers to stones, vines, leaves, soil or other objectionable material.

"Sunburn" refers to greenish discoloration which will not disqualify if confined to small areas of the tuber.

"Second Growth" refers to the secondary tuber development which has caused misshapen stock.

Fig. 2—Late blight infection on foliage

"Growth Cracks" refers to growth fissures other than those which are shallow and well healed.

"Rots" refers to all dry and wet rots in any stage of development.

"Freezing Injury" refers to frozen tissue or tissue showing the effects of having been frozen.

"Moderate Injury or Infection" in the case of wireworm and scab shall be considered to mean that the appearance shall not be injured to an extent readily apparent upon casual examination of the lot.

"Stem-End Discoloration" refers to dark streaks in the flesh radiating from the stem which penetrates more than ½ inch from the surface.

FACTORS IN PRODUCTION AFFECTING CERTIFICATION

It is suggested that growers who wish to apply for certification, confer with their county agent and be guided by his advice and counsel in matters relating to source of seed, methods of culture and disease and insect control measures to be followed in the growing of the certified seed crop. Diseases and insects must be kept under control in fields entered for certification.

Seed Source. One of the fundamental and basic requirements established for the growing of certified seed is that the source of seed used in fields entered for certification must be grown from seed stock secured from an approved source of foundation seed, and no fields will be certified unless the seed stock was previously approved.

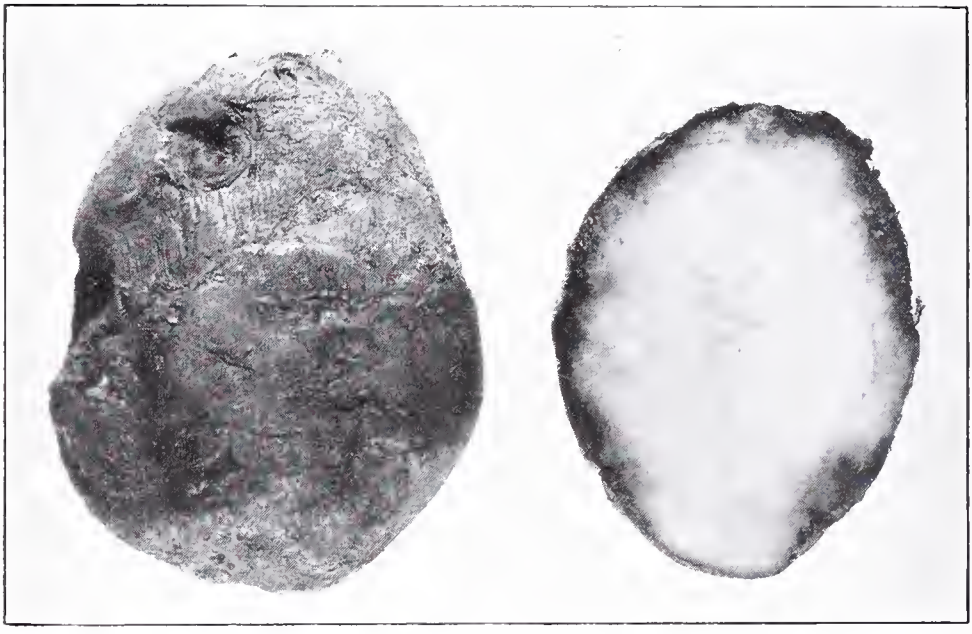

Fig. 3—Late blight tuber rot

There are conditions under which some of the degenerative diseases are masked and unless the seed is from a source that is known to be free from these diseases, complications are most certain to arise when this stock is planted the following year.

Culture. Fields entered for certification that are free from disease but that show the lack of proper care and attention will be rejected. Certified fields must always be kept in good tilth, free from weeds, diseases and insects. Only thrifty and vigorous fields will be certified. Growers of certified seed should follow a rotation that will return a maximum amount of vegetable matter to the soil in the form of humus. A soil with a high humus content conserves the moisture and produces thrifty and vigorous plants.

Isolation. The purpose of isolating seed fields from other potatoes is to prevent the spread of the common virus diseases such as leafroll and mosaic from the uncertified commercial crop to the certified stock. These diseases are spread by aphids or sucking insects from the diseased plants to the normal healthy plants. Aphids are very slow and sluggish in their movements but they are easily blown over short distances and for this reason it was considered desirable to require an isolation barrier. This may not prevent their dissemination entirely but it will most certainly reduce their spread to a minimum.

IMPORTANT DISEASES AFFECTING CERTIFICATION

Tip Burn. The leaf parts affected by tip burn are usually confined to the margin and tip of the leaf, and show as distinct irregular brown dead areas. These areas are dry, harsh and brittle with the affected leaves tending to turn upward and inward. Such injury works inward from the margin and end of the leaf and may finally involve the entire leaf or even the entire leaf petiole. It is most severe during dry, hot weather and especially when accompanied by severe attacks of leaf hoppers.

Early Blight. This disease appears as irregular or circular brown dead areas which are scattered over the surface of the leaf. These spots are also dry and brittle, measuring 1/8 to 1/4 inch in diameter except when two or more spots coalesce. These spots may occur on any portion of the leaf and are often patterned with a series of dark or even black concentric rings, giving the spots a target board effect. Injury from this disease is most severe when hot periods alternate with moist weather.

Late Blight. Late blight appears on the leaves as more or less circular dark water-soaked areas. These areas are dark brown with a definite grey mildew around the margin of the affected areas, particularly on the underside of the leaf. The disease is very severe during moist, mucky weather, when the temperature registers from 70 to 74 degrees Fahrenheit, often killing the foliage and vines completely. Severe attacks are accompanied with a characteristic rank and foul odor. Following a vine infection, late blight may also destroy an entire crop through rotting of the tubers. There is probably no other potato disease as devastating to the crop as late blight.

On the tubers the disease frequently appears at digging time as a wet mushy rot. In its dry form, however, it shows as dark brown or slightly purplish sunken areas on the surface of the tuber. The rot penetrates in an indefinite manner into the tuber as a dark, irregular mass of fibrous cells. Tuber infection takes place when the disease spores which are produced on the foliage as a grey mildew, mentioned above, come in contact with the tubers. This contact is usually brought about during rains which wash the spores into the ground and infection takes place. Tuber infection may also take place at digging time when the tubers come in contact with the in-

fected vines. When infection takes place at digging time the rot does not appear until later in the storage period.

Leafroll. The leaves of leafroll plants are rolled with the edges and tips turning upward and inward on the midrib, giving the leaf a spoon-shaped appearance. This rolling is always accompanied by a coarse leathery and harsh feeling to the touch. Such leaves are brittle and break when squeezed in the hand. Rolling is most pronounced in the lower leaves of the plant. Such plants are distinctly

Fig. 4—Left: Healthy plant. Right: Leafroll plant

dwarfed with a rigid, starry and upright habit of growth. Leafroll plants are light, greenish-yellow in color and sometimes show a slight purplish or bronzed discoloration of the leaf margins. Plants affected are very susceptible to **Tip Burn.**

Tubers from leafroll plants are small, fewer in numbers, and set close to the main stem. The original seedpiece remains very hard and watery and can often be found in this condition at digging time.

Mosaic. Mosaic plants usually show a mottling of light-green or yellowish-green areas in the leaf tissue. The leaves are more or less waxy, showing a pronounced glossy surface with the edges slightly waved or curled and the tip tending to curl slightly downward. Mosaic plants are usually normal in size except when the leaves are rugose and wrinkled. Plants that show rugose and wrinkled leaves are usually dwarfed. Several different types of this disease have been described by investigators, with each individual type having a combination of one or more of the above-mentioned symptoms. The effect on the tubers and the reduction of the crop in general depends largely on the type of mosaic involved. Each type apparently reduces the crop to a different degree. The types usually

found in Pennsylvania are mild mosaic, leafrolling mosaic, and rugose mosaic.

The tubers from rugose mosaic plants are usually small and set close to the stem as in leafroll. In leafrolling mosaic only the tubers at the very base of the stem are set close while those nearer the top are set at a more normal distance. In the case of mild mosaic the tubers are usually always set at a normal distance from the stem.

Giant Hill. In giant hill plants the leaves are darker green in color than normal, usually glossy and coarse, with slightly roughened elevations between the veins. The plants are extremely large and

Fig. 5—Left: Healthy leaf petiole. Right: Leaf petiole infected with mosaic

coarse with numerous lateral branches on the main stems. Such plants frequently show blossoms later than normal plants and often remain uninjured by light frosts. The root systems are fibrous, coarse, and heavy with tubers that are frequently very large and only one or two to a hill. Such tubers are rough with heavy, knuckle-shaped raisings back of the eyes. Excessive vegetative growth is the characteristic symptoms of this disease.

Rhizoctonia. Rhizoctonia appears on the potato in two different forms. First as a black scurf or sclerotia on the tuber. Second, as brownish-black scars or lesions on the underground stem, roots and stolons. In the latter form it may be found at any time during the growing season on young shoots or mature plants. When a tuber bearing the black sclerotia is planted the same conditions that bring about the germination of the seed piece may also cause the fungus contained in the sclerotia to germinate and attack the young growing shoots. The fungus may girdle the shoots completely and cause a miss in the stand. Should the seed piece succeed in producing a plant it will usually be late coming through the ground and may show evidence of the disease throughout the entire growing season. Later in the season these scars and lesions on the root parts produce a crinkled and rosetted appearance in the top of the plant. These crinkled leaves show a yellowing along the margin and tip while the lower leaves usually roll up in a cigar-shaped fashion. Enlarged nodes and aeral tubers are also common on severely infected plants. This disease may also attack young tubers and produce a russetting of the skin which may develop roughened cracks that deform the tuber. Under favorable conditions, preceding digging, the fungus forms the familiar black scurfy masses or sclerotia on the tuber. These sclerotia do not harm the tuber as they are entirely superficial, but they serve to carry the fungus over winter.

Rhizoctonia does its severest damage in spring following planting, when it destroys the young growing shoots and causes misses. The disease in this form is most active during periods of cold, wet weather and in wet soils.

Black Leg. This is a bacterial disease and attacks the underground stem of the potato plant. Infected stems show a distinct black, charcoal rotting through the pith, making identification quite easy. Rotting extends from the old seed piece through the stem to the surface of the ground. Leaves and branches of infected plants are pale-green in color and tend to grow upward, accompanied with more or less rolling of the leaves as in leafroll. Such plants are stunted and unthrifty and easily pulled up. Plants infected with black leg usually wilt and die before tubers are formed.

The disease produces a black, creamy, foul-smelling tuber rot. Decay usually starts at the stem-end and works inward through the flesh, often rotting out the heart of the tuber, leaving a cavity with a small opening at the stem or point of entrance.

Wilt. The upper leaves of infected plants are usually lighter in shade than normal and distinctly yellow around the lower part of the plant. One or several stalks in a hill may show evidence of infection. Infected plants often wilt in a few days, resulting in the premature death of the plant. The underground parts of stems of such plants show a browning of the woody tissue when cut across near the base.

Tubers from such plants show a brown discoloration of the vascular tissue near the stem-end. Vascular discoloration of the

stem and tuber is not a positive indication of the presence of this disease unless the condition is accompanied by a wilting of the plant.

Wilt occurs most frequently during periods of hot dry weather late in the growing season.

Common Scab. This disease is probably the most common of all potato diseases affecting the potato crop. It produces corky, dry, more or less circular, brown spots on the tubers, extending into the flesh for varying depths. These spots may be opened or filled with a dry, corky, coarse tissue and may cover the entire surface of the tuber.

Form of Official Tag Used in Tagging Pennsylvania Certified Seed Potatoes

Tags are attached to bags with lead and wire seal

Penna. **Certified**

SEED POTATOES

GRADE -- STANDARD SIZE

Variety .....

Grown By .....

County .....

Cert. No. ..... **Amt.** .....

(Front)

This certifies that these potatoes were grown for seed purposes, and that they were inspected by a representative of the PENNSYLVANIA DEPARTMENT OF AGRICULTURE, and found to meet the standards of quality adopted for the certification of seed potatoes in Pennsylvania.

.....
Inspector

I hereby assume all responsibility for the grade of potatoes contained in this bag, I also guarantee that these potatoes are part of those which were inspected and passed in accordance with the rules and regulations for the certification of seed potatoes adopted by the PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

Grower.....
Invalid without grower's signature or stamp

(Back)

Form of Certificate of Certification Issued to Growers of Pennsylvania Certified Seed Potatoes

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF AGRICULTURE

Bureau of Plant Industry

Seed Potato Certification Certificate No. .....

This is to Certify that the seed potatoes as listed below and grown by

..... Pa.,

have been officially inspected and passed in accordance with the standards adopted by the Pennsylvania Department of Agriculture for the certification of seed potatoes.

Crop of 19 Variety Grown ..... Acres Certified .....

Bushels per Acre ..... Bushels certified .....

The granting of this Certificate to the above named grower will permit him to market his seed potato crop of 19 , which has been officially inspected, as Pennsylvania Certified Seed Potatoes, provided that the official printed tag of Certification issued by the Bureau of Plant Industry is attached to each sack or container of seed potatoes so marketed.

(Seal)

Issued at the State Capitol, Harrisburg, Pa. .....

P. A. Bell

.....
Certification Inspector.

Director.

APPLICATION FOR CERTIFICATION OF SEED POTATOES

This application must be filed with the certification inspector for the Bureau of Plant Industry, Harrisburg, Pa., before July 1st.

Name .....

P. O. Address .....

County .....

I hereby make application for the certification of my seed potato crop as indicated below:

Acres	Variety	Seed Source

I will abide by the rules and regulations prescribed by the Pennsylvania Department of Agriculture for the certification of seed potatoes.

Date ..... Signed .....